

Topic: Ecological Succession

Title: Success with Succession

Grade Level: 9th grade, Regents Living Environment

Time: 1 week and 2 days

Set up: This lesson will take place over 1 week and 2 days. Each period is 40 minutes, and there are 3 double period (80 minute) periods during the 7 days.

Standards:

NGSS- HS-LS2-2: Biodiversity and Populations in Ecosystems. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. (Scale, Proportion, and Quantity)

SEP: Using Mathematics and Computational Thinking

CCC: Scale, Proportion, and Quantity

DCI: LS2.C: Ecosystem Dynamics, Functioning, and Resilience

CCSS PI 6.3 Explain how the living and nonliving environments change over time and respond to disturbances.

6.3b Through ecological succession, all ecosystems progress through a sequence of changes during which one ecological community modifies the environment, making it more suitable for another community. These long-term gradual changes result in the community reaching a point of stability that can last for hundreds or thousands of years.

6.3c A stable ecosystem can be altered, either rapidly or slowly, through the activities of organisms (including humans), or through climatic changes or natural disasters. The altered ecosystem can usually recover through gradual changes back to a point of long term stability.

Background:

Students must understand that ecosystems respond to change around them, whether caused by natural events or by humans, and whether major or minor changes result. The ecosystem is dynamic, ever changing, and is able to withstand/recover from disturbances. Students need to understand that stability in the ecosystem is always essential, and the environment can be resilient in ways that are truly astounding. The idea of succession links to larger themes like stability and change which is relevant not only to students in biology, but also in other science content areas.

Justification:

I chose this lesson to employ a real-world scenario to our content area. Sometimes students remark that learning about the environment isn't as "cool" as learning about DNA and genetics, but incorporating volcanos is a great way to hook students,

especially when it is an authentic scenario. By utilizing mathematics, students truly see the empirical evidence that succession is occurring. They can also understand the extent of time that succession takes, and understand that it is a dynamic process. Through technology, students can use their own voices to clearly explain the process of succession, which is more empowering, memorable, and more thorough than simply assessing via multiple choice. In creating these explanations, students are engaging in some science and engineering practice. Their explanations are more than regurgitation of facts, but demonstrate true understanding. Since we do this unit early in the year, students will have a solid foundation going forward as they build upon their science and engineering skills and perspectives.

Objectives:

- Create a graph depicting succession
- Explain the process of succession from beginning pioneer species to climax communities and understand the length of time the process occurs
- Support explanations with proper evidence from data
- When presented with a novel situation, students can identify aspects and main ideas of succession
- Observe succession on large scale (Mt. St. Helens) and small scale (abandoned car lot) yet see similarities between each process
- Utilize vocabulary such as pioneer species and climax community
- Understand that the ecosystem changes and employs resilience

Engage:

Students will first watch a [video](#) about Mt. St. Helens before the eruption. At the time of the eruption (1:00) I will pause the video and ask students to make an original claim (I may explain this is similar to a prediction) about how the environment will change as a result. Students will write their claim on an index card and keep it in their binder.

Explore:

Students will utilize [data from Carolina](#) to create a graph of the regrowth of specific species. Students will work in their lab groups, 4 students at a lab table, to collaborate and share ideas. Due to time constraints, each group member will create their own graph for one specific plot of land for the years provided for all species provided. Students will then share their graphs and answer the conclusion questions together, noting patterns that occur across all data.

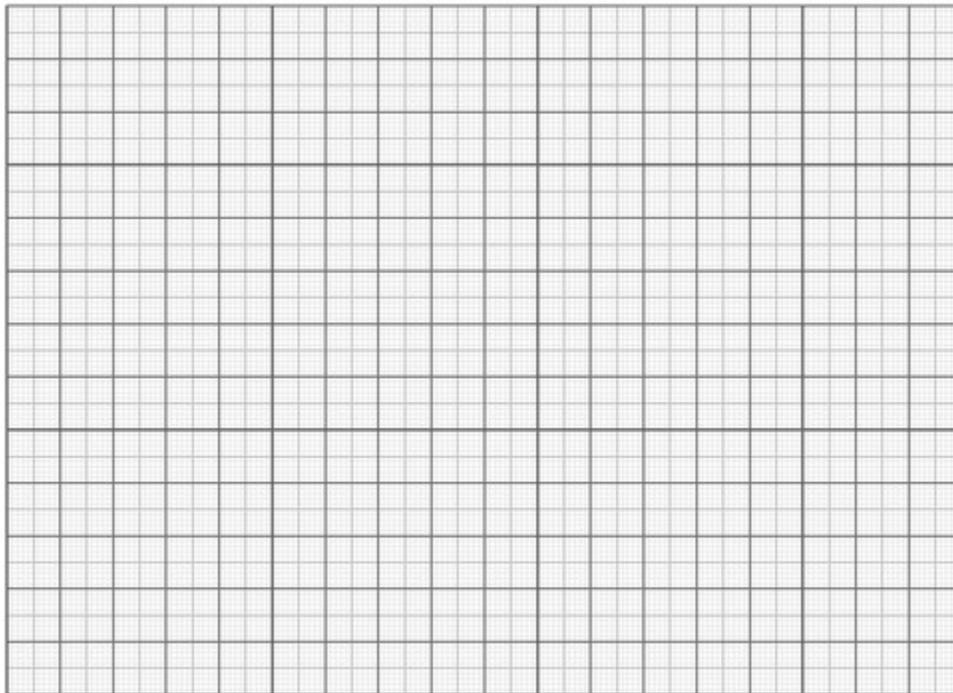
Name: _____ Date: _____

A Case Study: Mount St. Helens Eruption and Succession Data

This case study uses a small portion of data generated by the biologist [Roger del Moral](#) from the University of Washington, Seattle. Del Moral studied the biotic changes to the area of Mount St. Helens after it's eruption on May 18, 1980.

In your group of 4, each student will create a graph for a specific plot of land. While del Moral's data is vast, you will focus on plots from Butte Camp D 0, Butte Camp A 04, Pine Camp B 02,, Pine Creek A 04.

Create a graph of all the % cover for each type of plant in your specific plot.



Once completed, compare your graphs with your group. After making some comparisons, answer the following questions:

1. What patterns do you notice?
2. How do the graphs differ from each other?

3. How do you think the environment is responding to the eruption of Mount St. Helens?

4. Use your smartphone or chromebook. Research the names of the plants you plotted data for. For each plant, record your observations about the plant's appearance (height, color, etc).

5. Revisit your original claim that you wrote on your index card. Record it in the space below:

How does the data you've collected support or refute your claim?

Explain:

Students will complete a [reading via Project Learning Tree](#) and respond to questions. Then, students will learn specific vocabulary such as lichens, pioneer species (colonizers), climax community. Students will then refer back to their original claim about their prediction and will revise it based upon their knowledge, using evidence they've seen in the reading and graphing activities. I will then play the rest of the video so students can see if their claim was accurate. We will begin to discuss the idea of resiliency and recovering from disaster. At the end of the period, students will spend time modeling succession. On top of their modeling paper, the following suggestions will be there to help guide students:

Name:

Succession Model Sheet

Briefly describe the phenomenon:

Suggestions of possible things to include when making any models:

-components in the environment

-biotic and abiotic factors that may affect the phenomenon

-before/after pictures

-Small scale vs. large scale

-prediction of repeating the phenomenon

-prediction if the phenomenon continues

Drawing of your model:

Elaborate/Extend:

Students will observe [pictures of an abandoned car lot](#) posted around the classroom. As an individual, students will do a “gallery walk” style where they silently observe the images and jot down notes. Then, students will work with their lab groups to discuss their observations, focusing on what is similar and different from the Mt. St. Helens activity. After students start to notice similarities (all going through stages until climax community is reached) and differences (car lot starts with soil present, Mt. St. Helens started with bare soil), we will briefly discuss the idea of secondary succession as opposed to primary succession. As an exit ticket, students will complete a venn diagram of primary vs. secondary succession. We will also have a discussion about succession occurring on small and large scales.

Student Worksheet:

Name: _____ Date: _____

As you move throughout the room, use this space to take notes about your observations of the abandoned car lot.

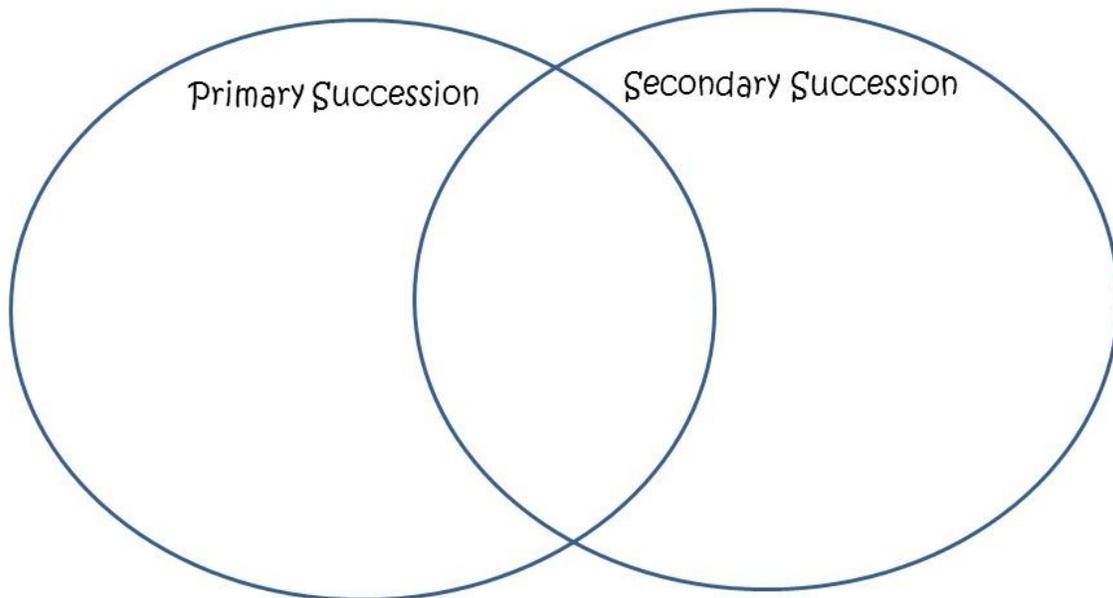
After observing the abandoned car lot, discuss your observations with your group. Record any new observations or group consensus in the space below:

As a class, we will discuss the similarities and differences between the environment following the Mt. St. Helens eruption and the abandoned car lot. Complete the venn diagram below:

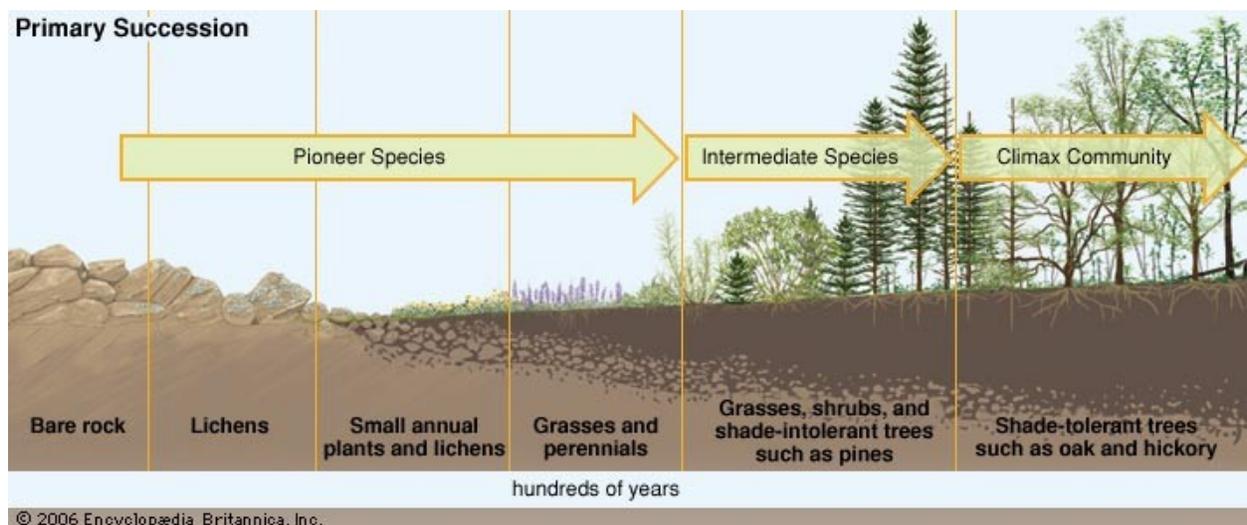
Similarities	Differences

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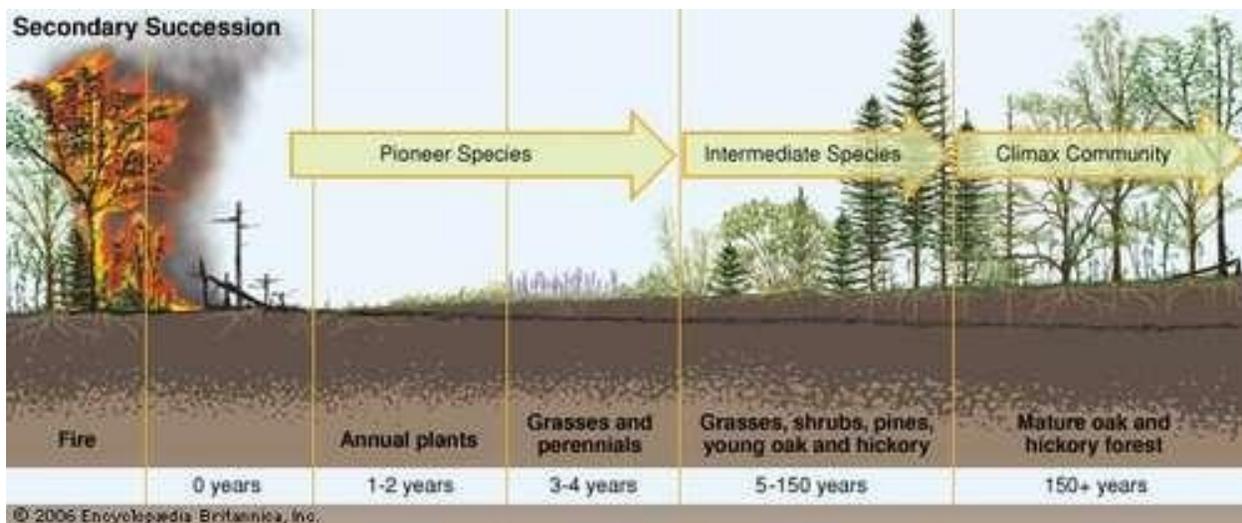
After viewing the slideshow as a class, complete the following venn diagram as an exit ticket:



Teacher slideshow:



Teacher will annotate diagram to highlight bare rock, define climax community, emphasize the idea that it takes hundreds of years, and discuss how the environment is dynamic and changes frequently.



Teach will annotate diagram to show that soil is already present, whether abandoned, plowed, or a disaster like fire that retains soil occurs. Teacher highlights similarities such as amount of time each stage takes, but highlight that since soil is already present and lichens are not necessary to form soil, the overall process is shorter. However, a climax community is reached here as well, and again the environment displays resilience no matter the changes occurring.

Scale: *Teacher plays [NASA simulation](#) of Mt. St. Helens data. Teacher then pulls up a Google image of a [car lot in town](#), as well as [Mount St. Helens National monument](#) to show the difference in scale between each place. Teacher will highlight that even though the environments and scales are different, the same process is occurring.*

Evaluate:

As a do-now, students will revise their original model to include knowledge from yesterday's discussion. They will do this in a different color so as to better see their changes. Then, students will utilize [time-lapse videos](#) provided from Mt. St. Helens. Using Screencastify, a chrome extension, students will record their voices over the time lapse. Students may write a script to ensure they are covering important concepts. According to the rubric, students will be graded on critical thinking, communication, content and collaboration. Students must include their claim about succession, support their claim with data, and include reasoning as to how the process occurs. Throughout the recording, students must include specific vocab such as pioneer species and climax species.

Script worksheet:

Name: _____ Date: _____

Using screencastify, you will record your voice explaining your claim, evidence, and reasoning of succession in regards to the Mount St. Helens eruption of 1980.

Throughout the video, make sure you include the following information:

- Your claim about succession
 - Include information about what succession is, the timeframe, and the type of succession in this situation
- Evidence of succession
 - Include data from your graphing activity OR research new data if needed
- Reasoning for succession
 - Connect this to the ecosystem on various scales
- Vocabulary
 - Primary or secondary succession
 - Pioneer species
 - Climax species

When it comes time to record, be sure to record in a quiet space with little/no background noise. Ensure your voice is measured, clear, and your pacing is appropriate.

Assessment Rubric:

Criteria	3	2	1	Comments
Critical Thinking	Student uses proper evidence to support their claim. The claim is clear, appropriate and relevant.	Student uses some evidence to support their claim, but there is some lacking AND/OR the claim is not clear, appropriate and relevant.	Student uses no evidence to support their claim AND/OR the claim is not appropriate and relevant OR a claim is never made.	
Communication	Student properly uses screencastify. Voice is clear, no background noise, and script is professional.	Student properly uses screencastify, but the presentation is not professional.	Student does not properly use screencastify and the product is not professional.	
Content	Student uses all	Student uses	Student	

	succession vocabulary, such as primary or secondary succession, pioneer species, climax species. The information presented is correct.	some succession vocabulary, such as primary or secondary succession, pioneer species, climax species. The information presented is mostly correct.	doesn't include critical succession vocabulary, such as primary or secondary succession, pioneer species, climax species. The information presented is not correct.	
Collaboration	Student works well with partners, takes initiatives, encourages other's ideas, and contributes positively to group.	Student may contribute to group, but does not always contribute in a positive manner, OR doesn't always take initiative, and doesn't listen to others.	Student does not contribute to the group in a positive way.	

Sources:

<http://www.nysed.gov/common/nysed/files/programs/curriculum-instruction/livingen.pdf>
CCSS

<https://thewonderofscience.com/standards>

https://www.youtube.com/watch?v=-H_HZVY1tT4 video of eruption

https://www.plt.org/stuff/contentmgr/files/1/47089543432aae6ee76a2c1d9fd698cf/files/focus_on_forests_activity_2_sp_1_mount_st_helens.pdf Reading about Mt. St. Helen's

<https://www.field-studies-council.org/urbaneco/urbaneco/wasteland/carpark.htm>
ELABORATE MAYBE????

<https://www.carolina.com/pdf/essentials/mount-sthelens/mount-st-helens-eruption-and-succession-data.pdf> Data for graph

<https://www.carolina.com/teacher-resources/Interactive/succession-on-mount-st-helens/tr48702.tr>

<http://www.mshslc.org/return-to-life/changing-landscape/> time lapse for evaluate

<https://www.field-studies-council.org/urbaneco/urbaneco/wasteland/carpark.htm>
abandoned car lot

<https://earthobservatory.nasa.gov/world-of-change/StHelens> NASA simulation

<https://www.plt.org/activity-resources/focus-on-forests-activity-2-story-of-succession/>
PLT resources

<https://www.globalforestwatch.org/about/> global forest watch

<https://www.google.com/maps/place/Mount+St.+Helens+National+Volcanic+Monument/@46.2281046,-122.4750624,10z/data=!3m1!4b1!4m5!3m4!1s0x54969956f1476a01:0xdb19f41c06e23e42!8m2!3d46.2401661!4d-122.1966618>

<https://www.google.com/maps/place/Rye+Subaru/@40.9742258,-73.7529313,12.41z/data=!4m8!1m2!2m1!1scar+lot+rye!3m4!1s0x89c290cb0bf1482b:0x9e53d1d5b98b2d48!8m2!3d40.9855744!4d-73.6816028> Google maps